

Semester: 3				
Course: Skill Enhancement Course 1				
Paper Title: Biophysical Methods and Bioinorganic Chemistry				
Paper Code: S2BT230311T			Credits: 3	
Hours/week: 3				
Category: Core/MDC/SEC/VAC: SEC				
Theory / Practical / Composite: Theory				
No of Modules: 1				
Course Overview:				
1. Understanding the application of buffer solution and its importance in biological system.				
2. Acquiring a knowledge to understand the principles of chromatography and its application.				
3. Understanding the principles of spectroscopy and its application.				
4. Gaining a concept of Bioinorganic Chemistry and its application.				
5. Gaining a comprehensive overview of various technical methods which have useful applications in Biotechnology.				
Course Outcome:				
1. Remember various calculation of pH, buffer solution, different chromatographic techniques, spectroscopy, role of metal ions present in biological systems.				
2. Apply principles of chromatography to separate biomolecules, importance of buffer solution in biological system, Lambert-Beer Law in different experiments, structure and function of different enzymes.				
3. Analyze hydrolysis of salts and its application, principles of various spectroscopic and chromatographic techniques and its application, phosphate transfer and metabolic energy in biological systems.				
4. Understand Henderson Hasselbalch equation, buffer capacity, different chromatographic and spectroscopic techniques to separate biomolecules, elements of life, classification of elements according to their action in biological system.				
5. Evaluate various technical methods (Chromatography and Spectroscopy) which have useful applications in Biotechnology, buffer solution in biological systems like regulations of bicarbonate buffer, importance of physiological role of haemoglobin and myoglobin and different enzymes.				
6. Create a comprehensive overview of buffer solution and its application, importance of spectroscopy and chromatography, a concept of Bioinorganic Chemistry and its application.				
SYLLABUS				
UNIT/Module	CONTENT	HOURS or NUMBER OF CLASSES	CO Mapping	COGNITIVE LEVEL
	UNIT I: Buffer solution and its application: Ionic product of water, pH scale, Calculation of pH for strong acid, strong base, weak acid and weak base.	3 classes per week	CO1-CO6	K1-K6

	<p>Hydrolysis of salt-calculation of hydrolysis constant, degree of hydrolysis and pH for different salts. Buffer solutions, pH of buffer solutions, Henderson Hasselbalch equation, Buffer capacity, Buffer solution in biological systems, Regulations of Bicarbonate buffer, pH meter.</p> <p>UNIT II: Chromatography: Introduction to the principle of chromatography. Paper chromatography, Thin layer chromatography, Column chromatography: silica and gel filtration, affinity and ion exchange chromatography, HPLC. Principles of Gel Electrophoresis. Overview of sedimentation and density gradient techniques.</p> <p>UNIT III: Spectroscopy: Absorption and emission spectroscopy, Lambert-Beer Law, Spectrophotometry (UV, visible, infrared), colorimetry, fluorimetry.</p> <p>Unit IV: Bioinorganic Chemistry: A brief introduction to Bioinorganic Chemistry, Elements of life, Classification of elements according to their action in biological system, Role of metal ions present in biological systems</p>			
--	---	--	--	--

	(Na ⁺ , K ⁺ , Ca ²⁺ , Mg ²⁺ , Fe ³⁺ /Fe ²⁺ , Cu ²⁺ /Cu ⁺ , Zn ²⁺). Oxygen carrying proteins - structure and physiological role of haemoglobin and myoglobin. Electron transport proteins-iron-sulfur proteins and cytochromes. Redox enzymes- Fe, Cu, Zn-containing redox enzymes. Hydrolytic enzymes- carboxypeptidase A, carbonic anhydrase. Phosphate transfer and metabolic energy.			
Text Books				
1. P. S. Kalsi, Spectroscopy of Organic Compounds.				
2. C. N. Banwell & E. M. McCash, Fundamentals of Molecular Spectroscopy, 4th Edition.				
3. Upadhyay, Upadhyay and Nath, Biophysical Chemistry: Principles and Techniques.				
4. Asim K. Das, Bioinorganic Chemistry.				
Evaluation: Theory (50) CIA- 10, Assignment – 03, Attendance – 02, Semester Exam- 35				
Paper Structure for Theory Semester Exam: Compulsory objective questions: 1 × 5= 5 marks Any three out of four questions: Each of 10 marks with subparts [No sub-part will be more than 5 marks]				

Course outcomes (COs) and Cognitive Level Mapping

COs	CO Description	Cognitive levels
CO1	Remember various calculation of pH, buffer solution, different chromatographic techniques, spectroscopy, role of metal ions present in biological systems.	K1
CO2	Apply principles of chromatography to separate biomolecules, importance of buffer solution in biological system, Lambert-Beer Law in different experiments, structure and function of different enzymes.	K2
CO3	Analyze hydrolysis of salts and its application, principles of various spectroscopic and chromatographic techniques and its application, phosphate transfer and metabolic energy in biological systems.	K3
CO4	Understand Henderson Hasselbalch equation, buffer capacity, different chromatographic and spectroscopic techniques to separate biomolecules, elements of life, classification of elements according to their action in biological system.	K4

CO5	Evaluate various technical methods (Chromatography and Spectroscopy) which have useful applications in Biotechnology, buffer solution in biological systems like regulations of bicarbonate buffer, importance of physiological role of haemoglobin and myoglobin and different enzymes.	K5
CO6	Create a comprehensive overview of buffer solution and its application, importance of spectroscopy and chromatography, a concept of Bioinorganic Chemistry and its application.	K6